CLAIMS

What is claimed is:

1. An eye-safe laser comprising:

a laser for coupling to a source of pump energy to generate laser energy; and

a wavelength shifting crystal coupled to the laser for generating eye-safe light from the laser energy.

2. The eye-safe laser of Claim 1 wherein the laser energy has a wavelength of about 1.3 microns.

3. The eye-safe laser of Claim 1 wherein the eye-safe light has a wavelength of about 1.5 microns.

4. The eye-safe laser of Claim 1 further comprising the source of pump energy.

5. The eye-safe laser of Claim 4 wherein the source of pump energy comprises a laser diode or a laser diode array.

6. The eye-safe laser of Claim 1 wherein the wavelength shifting crystal comprises a Raman shifting crystal.

7. The eye-safe laser of Claim 6 wherein the Raman shifting crystal comprises $BaNO_3$ or $KGd(WO_4)_2$.

8. The eye-safe laser of Claim 1 further comprising a reflective coating on an inside end face of the wavelength shifting crystal that is highly transmissive of the laser energy and is highly reflective of the eye-safe light.

9. The eye-safe laser of Claim 1 further comprising a reflective coating on an outside end face of the wavelength shifting crystal that is highly reflective of the laser energy and is highly transmissive of the eye-safe light.

10. The eye-safe laser of Claim 1 wherein the laser comprises:

an input coupler for coupling to a source of pump energy;

a laser gain element coupled to the input coupler for generating laser energy from the pump energy; and

an output coupler coupled to the laser gain element.

11. The eye-safe laser of Claim 10 wherein the input coupler, the laser gain element, the output coupler, and the wavelength shifting crystal are joined by at least one of diffusion bonding, gluing, and optical contacting by mechanical means.

12. The eye-safe laser of Claim 10 further comprising a passive Q-switch coupled to the laser gain element for increasing peak power output.

13. The eye-safe laser of Claim 12 wherein the input coupler, the laser gain element, the passive Q-switch, the output coupler, and the Wavelength shifting crystal are joined by at least one of diffusion bonding, gluing, and optical contacting by mechanical means.

14. The eye-safe laser of Claim 12 wherein the passive Q-switch comprises a passive Q-switch material.

15. The eye-safe laser of Claim 13 wherein the passive Q-switch material is V^{3+}:YAG or Nd^{2+}:SrF_2.

16. The eye-safe laser of Claim 12 wherein the output coupler comprises a reflective coating between the Q-switch and the wavelength shifting crystal that is partially reflective of the laser energy and is highly reflective of the pump energy.

17. The eye-safe laser of Claim 10 further comprising a focusing lens coupled to the laser diode for focusing pump energy on the laser gain element.

18. The eye-safe laser of Claim 10 wherein the input coupler comprises a reflective coating on an end face of the laser gain element between the laser gain element and the pump energy source that is highly transmissive of the pump energy and highly reflective of the laser energy.

19. The eye-safe laser of Claim 10 wherein the output coupler comprises a reflective coating between the laser gain element and the Wavelength shifting crystal that is partially reflective of the laser energy and highly reflective of the pump energy.

20. The eye-safe laser of Claim 10 wherein the laser gain element comprises an $Nd^{3+}:YAlO_3$ crystal having a laser wavelength of about 1.3 microns.

21. An eye-safe laser comprising:
means for generating laser energy; and
means for transforming the laser energy into eye-safe light.

22. The eye-safe laser of Claim 21 wherein the laser energy has a wavelength of about 1.3 microns.

23. The eye-safe laser of Claim 21 wherein the

eye-safe light has a wavelength of about 1.5 microns.

24. The eye-safe laser of Claim 21 wherein the means for generating laser energy comprises:

an input coupler for receiving pump energy;

a laser gain element coupled to the input coupler for generating laser energy from the pump energy; and

an output coupler coupled to the laser gain element.

25. The eye-safe laser of Claim 24 further comprising means for generating the pump energy.

26. The eye-safe laser of Claim 25 wherein the means for generating the pump energy comprises a laser diode or a laser diode array.

27. The eye-safe laser of Claim 24 wherein the input coupler, the laser gain element, the output coupler, and the means for transforming the laser energy into eye-safe light are joined by at least one of diffusion bonding, gluing, and optical contacting by mechanical means.

28. The eye-safe laser of Claim 24 further comprising means for increasing peak power output of the laser gain element.

29. The eye-safe laser of Claim 28 wherein the means for increasing peak power output comprises a passive Q-switch material.

30. The eye-safe laser of Claim 29 wherein the passive Q-switch material is V^{3+}:YAG or Nd^{2+}:SrF_2.

31. The eye-safe laser of Claim 24 further comprising means for focusing the pump energy on the laser gain element.

32. The eye-safe laser of Claim 24 wherein the laser gain element comprises an $Nd^{3+}:YAlO_3$ crystal having a laser wavelength of about 1.3 microns.

33. The eye-safe laser of Claim 21 wherein the means for transforming comprises $BaNO_3$ or $KGd(WO_4)_2$.